

Social Status, Social Context, and Arterial Blood Pressure

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ABSTRACT As social change and economic development have proceeded, the prevalence of chronic diseases, especially cardiovascular diseases, has increased in the developing world. In part this is due to the adoption of diets and other health behaviors characteristic of industrialized nations; in part it is a function of changing social and economic circumstances. In this paper, we describe the development and testing of a model designed to account for social and economic effects on cardiovascular disease risk. The model incorporates the fact that global economic processes have made a lifestyle characterized by the consumption of Euroamerican material goods and information a basis for the assignment of social status in local communities. But economic change at the local level is rarely sufficient to provide a foundation for individuals' status aspirations. Hence, many individuals attempt to maintain a lifestyle inconsistent with their economic standing, a variable we term lifestyle incongruity. Here we describe how this factor is associated with higher blood pressure in a variety of settings and also how the effects of lifestyle incongruity can be modified in local contexts by social class and social role processes.

This latter process, contextual modification, is illustrated by data from American Samoa. In this example, the association of lifestyle incongruity with blood pressure is examined in 30 male household heads and 26 spouses. After an examination of Samoan ethnography focused attention on the importance of age and gender differences as defining social contexts of intracultural variation, the model was modified to assess interactions between age and gender as they affect the association of lifestyle incongruity and blood pressure. Lifestyle incongruity is strongly associated with higher systolic and diastolic blood pressure for the younger household heads, minimally associated with blood pressure for older household heads, and only slightly associated with the blood pressure of their spouses. The regression coefficients for the lifestyle incongruity by age by sex interaction term was significant at $P \leq 0.01$ for both systolic and diastolic blood pressure. The consistency of these results with expectations based on the ethnographic record is emphasized in the interpretation.

We feel that the lifestyle incongruity model represents an empirically successful attempt to link global political-economic processes, local social structure, and biological outcomes. *Am J Phys Anthropol* 102:55-66, 1997.

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Comparative research on cardiovascular disease risk factors, especially arterial blood pressure, has documented wide variation across social groups. Generally speaking, there is a gradient of increasing blood pressure that corresponds to a gradient of increasing modernization or economic develop-

ment (Waldron et al., 1982) (see Fig. 1). Two primary hypotheses have been proposed to account for this finding. The first is a dietary

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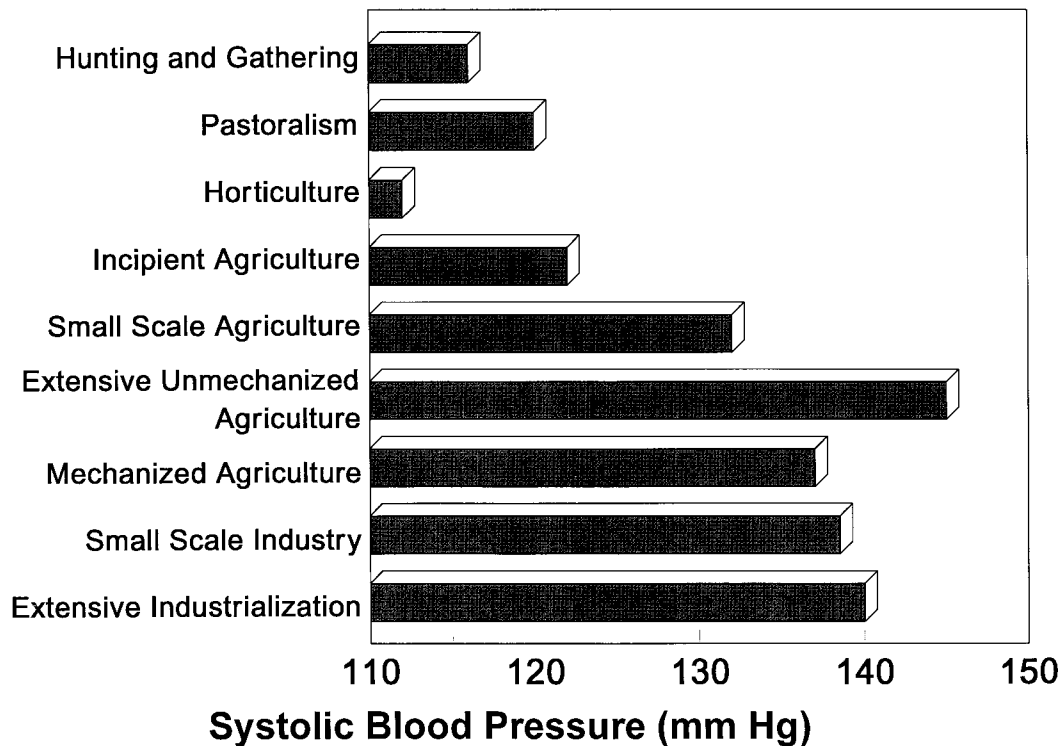


Fig. 1. Average systolic blood pressure of adults from groups of varying levels of sociocultural development, modified from Waldron et al. (1982).

hypothesis. This hypothesis proposes that as societies modernize, individuals come to adopt a diet similar in nutrient content to that consumed in North America and other industrialized societies. Such a diet is characterized by a high intake of fat (in excess of 40% of total caloric intake), high dietary cholesterol, and high sodium intake. When coupled with overall high caloric intake and limited physical activity, which predispose toward obesity, the result is an unfavorable profile of cardiovascular disease risk factors. The available evidence indicates that the dietary hypothesis accounts for some but not all of the cross-cultural and intracultural variability in risk (Waldron et al., 1982; Beaglehole, 1990).

The second proposed hypothesis suggests that it is the stress of modernization that accounts for an increase in cardiovascular disease risk. Underlying this hypothesis is the recognition that modernization involves a shift in behaviors of persons affected,

including (but not limited to) the adoption of wage labor pursuits, increased requirements for formal education, increased commodification of time, exposure to new sources of information, and a diminished emphasis on conventional forms of social relationships. Again, available evidence indicates that this sort of process accounts for some of the observed variation in blood pressure.

There are, however, serious problems with conventional ways in which this stress process has been conceptualized and operationalized. From a theoretical standpoint, most damaging is the critique articulated by Young (1980). In his critique, he argues that stress models developed for Euroamerican societies essentially recapitulate a general Western notion of personhood. By this he means that there is an almost exclusive focus in conventional stress models on individuals and their thoughts, feelings, and motives. Stress is viewed as something that happens to individuals, and the response of the indi-

vidual to some external pressure or stimulus is almost completely a function of how that individual construes or perceives that stimulus. There is little effort directed to a consideration of macrosocial forces operating in such models because the underlying assumptions dictate that there is little need to take account of such considerations; whatever affects the individual is filtered through belief and perception.

We will not argue here that conventional stress models are without utility; indeed, these models have stimulated a remarkable body of research. Rather, we will argue that the failure to link individuals to macrosocial processes has led, as Young (1980) argues, to an essentially asocial view of the individual and that the further refinement of stress models is to be found in the exploration of systematic links of the individual to his or her social, economic, and political context. Any refined model of disease in its social and cultural context must include individual differences in the model, since the link to biologically plausible physiologic processes must be maintained. Explaining variability of blood pressure at the individual level requires a number of different variables, including fixed characteristics of the person (e.g., age, sex), characteristics related to energy intake and expenditure (e.g., diet, obesity), and social and psychological characteristics. Our focus is on these latter characteristics in a particular sense: to outline a model in which individual differences in social and psychological characteristics can be traced to macro-level social processes. In this exercise, the aim is not so much to account for as much variability in blood pressure as possible but rather to describe an empirically satisfying and plausible account of how some of those individual differences are linked to larger social and economic forces.

In the remainder of this paper, we will sketch a model of the social production of disease that retains a cognizance of macrosocial and political forces but that also explicitly seeks to understand those social forces in the context of individual lives and individual physiology. We then present a test of this model to illustrate how intracultural context can influence the social production

of disease using data on the blood pressure of adults in American Samoa.

SOCIAL CHANGE AND DISEASE RISK

As noted above, there is an increasing gradient of morbidity and mortality from cardiovascular disease that accompanies change in a society that has conventionally been referred to as modernization or industrialization. Much of the work in cross-cultural epidemiology has been guided by a kind of unilinear model of social change, suggesting that societies are progressively changing in the direction of the adoption of industrialization as an economic base. This view of global economic change has, however, been largely discredited in favor of a perspective that sees the less-developed nations of the world linked with industrialized nations in a state of dependency (Worsley, 1984). In this global systems view, social change needs to be understood in terms of the links between the centers of political and economic power and those local communities on the periphery of this system, the communities that have been the traditional subjects of anthropological inquiry.

Global economic change has involved the progressive penetration of capitalist market systems into the daily lives of traditional peoples. There are two senses in which this has occurred. First, economic changes have been generated in developing societies by their involvement in the global economic system. These changes have often involved the redirection of local economies toward production for export as opposed to local consumption. Examples would be the development of the export banana industry in the West Indies or the tuna-canning industry in Samoa. Second, underdeveloped societies have adopted patterns of material consumption like those associated with European and American middle classes. In even isolated local communities, the knowledge of and availability of middle-class consumer goods and lifestyles is widespread.

While the economic impact of this penetration has been analyzed, there has been insufficient attention paid to the social impact. That is, the availability of material

consumer goods, information sources, and behavior patterns characteristic of Euroamerican middle classes can alter the nature of social relations at the local level, especially in terms of the allocation of social status or prestige (Dressler, 1982). Prestige and its consequent social influence come to be associated with success in attaining valued lifestyles—characterized by the ownership of consumer goods, the knowledge of styles and trends, and the adoption of leisure pursuits—rather than with adherence to traditional forms of status attainment (e.g., participation in religious cargoes in Mesoamerica, service to the extended kin group in Samoa, or religiosity in a rural African-American community).

Classic social theory suggests, however, that attaining a valued lifestyle is insufficient to be granted associated prestige unless one's status with respect to the means for achieving that lifestyle is commensurate. Put differently, within social systems there is a recognition that lifestyles can be "fraudulently" manipulated (Goffman, 1951); therefore, recognition of a claim to high status on the basis of lifestyle in mundane social interaction can only be tentative until the other bases for that claim, including occupational status and educational credentials, can be evaluated.

Operationally, this theoretical perspective generates a measurement and analytic model in which socioeconomic differences are decomposed into two orthogonal sources of variability: a general dimension represented by the weighted average of occupational status, education, and lifestyle and a dimension of the disparity between lifestyle and occupation/education. This model can be represented as

$$Y = a + b_1(x_1 + x_2) + b_2(x_1 - x_2) + e, \quad (1)$$

where Y stands for any biological or behavioral outcome hypothesized to be influenced by the acquisition of Euroamerican middle class values and lifestyles, x_1 represents lifestyle, operationalized by a scale of the consumption of material and information goods, and x_2 represents the household economic resources, operationalized as occupation and/or education. The first independent variable term that sums lifestyle and eco-

nomical resources can best be interpreted as a conventional aggregate dimension of socioeconomic status, or SES. The second dimension, the difference between lifestyle and economic resources, has been termed lifestyle incongruity. This dimension assesses the extent to which individuals are attempting to maintain and present a style of life that is inconsistent with their socioeconomic standing, as assessed by occupation and/or education. It may seem counterintuitive that these two terms (the sum and difference terms) would be orthogonal, but they clearly are (Whitt, 1983).

This model extends a more general theoretical orientation termed "status inconsistency" (Vernon and Boffler, 1988) in medical sociology. Status inconsistency refers to the discrepancy between any two dimensions of status (e.g., occupation and education or education and income). Status inconsistency models have been used in anthropological studies (McGarvey and Schendel, 1986; Janes, 1990) of blood pressure. The lifestyle incongruity model is an extension of the more general notion of status inconsistency in that lifestyle incongruity focuses on the actual behavioral components of status that serve to motivate the consumption aspirations in many developing societies.

Taking blood pressure as the outcome, eight field studies, including the West Indies, Mexico, Brazil, and the United States (reviewed in Dressler, 1993), Samoa (Bindon et al., 1991; Knight, 1993), and England (Dressler, 1994) have replicated the lifestyle incongruity model. In each of these studies, higher lifestyle incongruity (i.e., increasing discrepancy between lifestyle and occupation/education such that the presented claim to prestige manifested by lifestyle is higher than status based on occupational and/or educational rank) has been associated with higher blood pressure after controlling for age, sex, and an anthropometric indicator of obesity such as body mass index.

Additionally, other conventional blood pressure risk factors have been measured in several of these studies and have been used to test competing hypotheses. For example, high quality dietary data were available in the research in Brazil (Dressler et al., 1987). In that research, four separate 24 h dietary

recalls were obtained from each individual in the sample ($n = 129$) and averaged to estimate nutrient intake. Lifestyle incongruity was associated with higher diastolic blood pressure independently from the significant effects of calcium intake and total fat intake (sodium intake had no effect). In other studies (reviewed in Dressler, 1993), other sorts of psychosocial variables have been measured, including perceived social role stresses, economic stresses, stressful life events, and the Type A behavior pattern. In no case did these variables, whatever their effects, diminish the effect of lifestyle incongruity on blood pressure.

This has led us to emphasize a somewhat different interpretation of this effect than that typically associated with stress models. This interpretation rests on the notion that lifestyles in part mediate mundane social interaction. As Veblen (1918) argued in his original formulation, individuals are motivated to accumulate elements of lifestyles in order for them to display their self-defined place in the system of social stratification. In this sense, the individual struggling to maintain a higher style of life in the context of low SES is projecting a sense of identity into these social interactions. The problem remains, however, that, as Goffman (1951) argued, status is not awarded on the basis of lifestyles alone; rather, individuals seem to use a complex cognitive algorithm that combines information from a variety of dimensions before confirming status. Therefore, we have suggested (Dressler, 1993) that individuals who are status-incongruent are continually scanning the social field during any mundane interaction, searching to determine if they are being responded to with the sense of respect that they desire.

This argument converges with a growing body of literature on cardiovascular reactivity, which shows that individuals have regular and profound cardiovascular responses to situations of just this kind that can be reproduced in the laboratory. For example, Smith and his colleagues (1989) have shown that when an individual is placed in a situation in which he or she must convince another individual of a particular argument, even one of little interest to the participants, the individual charged with doing the con-

vincing reacts with marked elevations in blood pressure and heart rate and experiences a slow recovery from this elevation. In the case of lifestyle incongruity, individuals may be attempting to convince, as it were, others of their status on a regular daily basis and experiencing this same kind of reactivity. This physiologic mechanism, demonstrably sensitive to social interaction, may account for the observed effects of lifestyle incongruity.

It is important to emphasize that the prevalence of discrepancies in status is likely to be larger in certain communities than in others. Being able to maintain a consistency in occupation/education and lifestyle is, in part, a function of individual motivation. In part, however, it is a function of the opportunities for occupational and educational mobility. In many of the studies of lifestyle incongruity, the lifestyle being maintained is not particularly elaborate or certainly not outlandish; rather, as Veblen (1918) observed many years ago, the aim of material consumption is not so much conspicuous consumption as it is to maintain a conventional standard of decency (i.e., there is a certain level of consumption that is considered appropriate). To be considered socially a decent person, one must be able to maintain a certain standard of consumption. And the measurement of lifestyle reflects this. Yet there are still substantial discrepancies. What this means is that the problem resulting in lifestyle incongruity is not so much high material consumption as it is highly restricted opportunities for upward social mobility, restricted opportunities that result from the slow pace of economic change in developing societies.

SOCIAL CONTEXT OF LIFESTYLE INCONGRUITY

In examining further the utility of this model, we have begun to explore the ways in which the effects of lifestyle incongruity on blood pressure vary by social context. In various tests of the model referred to above in equation 1, clear main effects of lifestyle incongruity on blood pressure have been observed, adjusting for relevant covariates. By the same token, however, in several of the studies (Bindon et al., 1991; Dressler,

1993, 1994) other social factors have been observed to moderate the effects of lifestyle incongruity. For example, in several studies, incongruity has been found to be modified by the age of the individual. Generally speaking, blood pressure rises modestly in association with increasing lifestyle incongruity among younger (age <40) persons; among persons aged 40 to about 55, the effect of incongruity on blood pressure is strongest; then, over the age of about 55, the effect of incongruity on blood pressure essentially disappears (Dressler, 1994). With this pattern of findings, it seems unlikely that the observed effects are a function of physiologic processes associated with aging, although this remains a possibility. Rather, it may be that age signifies something important about the social processes of status attainment and what happens when the struggle for status maintenance is compromised.

The contextual modification of the effects of lifestyle incongruity on blood pressure can be further illustrated using a set of data collected by Crews and Bindon in American Samoa. In 1989, they undertook a survey of lifestyle effects on the blood pressure of a small sample of Samoan men residing on Tutuila, the largest and most populous island of American Samoa. Other aspects of this study have been presented elsewhere (e.g., Crews et al., 1991, 1993; Bindon et al., 1991; Bindon and Crews, 1993). In the remainder of this paper, we will present the results of our attempt to understand lifestyle incongruity effects on blood pressure as modified by intracultural context.

METHODS AND TECHNIQUES

Sampling

The sampling in the 1989 American Samoa survey focused on men who had been seen by Bindon in 1976 (Bindon and Baker, 1985). This strategy allowed for a 12 year follow-up on the health status of individuals while at the same time permitting some control over variables of interest, including blood pressure. The sample was dichotomized into high and low blood pressure groups depending upon whether or not the man's systolic was above 140 or the diastolic was above 90 in the 1976 study. Justification for this blood pressure dichotomy was pro-

vided by an analysis of blood pressure and subsequent mortality among American Samoans by Crews (1988), and further details of this sampling are presented in Bindon et al. (1991) and Bindon and Crews (1993). Of the 255 eligible men surveyed in 1976, 136 were in the normotensive group, and 119 were in the high blood pressure group. We sampled within these two groups at random, ending up with 14 in the normal blood pressure group and 16 in the high. The small size of this sample was necessitated by fiscal constraints on the survey as well as time constraints imposed by the modest interview schedule required to collect the social data needed to operationalize the lifestyle incongruity model. In addition to the 30 men, 26 of their spouses were surveyed, representing 96% of the currently living spouses (one wife was off-island and unavailable during the survey; three of the men were not married at the time of the survey). The participants were highly cooperative, with only one refusal noted, for a refusal rate of less than 4%. The survey was conducted in the homes of the men.

Measurements

In addition to determination of height and weight (not reported here) following techniques advocated by Weiner and Lourie (1981), skinfolds were measured with a Lange caliper at the triceps site. Three skinfold measurements were taken at the triceps site, and the average of these three measurements has been used in this analysis. The triceps site was chosen based on the extensive experience of Bindon in measuring skinfolds in the Samoan population. Many other skinfolds, especially those on the trunk, exceed the capacity of the calipers, leaving substantial (10% or more in some prior surveys) segments of missing data. For this same reason, summation of measurements at several skinfold sites is not practical because of missing data on trunk skinfolds. The triceps skinfold was used in the regression analyses presented below because this measurement showed the strongest bivariate relationship with blood pressure, substantially stronger than body mass index. Blood pressure readings were measured with a mercury Baumano-

meter sphygmomanometer after the subject was seated for a minimum of 10 min. Two readings were taken, and the average of the two has been used in all analyses.

An interview schedule was generated using protocols modified from Dressler (1982) and Bindon (1984). The general protocols were modified to account for the social context in American Samoa by Bindon, who administered most of the interviews. Questions about employment, education, household structure and material culture, and the health history of the subjects were asked. A five-point scale ranging from one for unemployed or subsistence farming to five for high status, high income occupations was developed by Bindon. Economic resources were operationalized as the sum of the occupational scores of the household head and his spouse and other wage-earning household members. Lifestyle was operationalized after Dressler (1982) using an index of housing quality, material goods, media use, and travel. This index is a simple sum of the scores on the lifestyle questions.

Statistical analysis

All descriptive and analytic statistics were calculated with SPSS-X. The lifestyle index was assessed using the RELIABILITY procedure which tests for additivity of the items. Chronbach's alpha gives a measure of appropriateness of adding the items of a scale, with a value of 0.70 or better indicating that the items fit together well to give a combined score. The results of the reliability analysis are presented in Table 1, where the substantial Chronbach's alpha of 0.811 indicates that the scale is highly additive and the combination of the items is appropriate in this instance.

On the basis of previous experience and published Samoan ethnography, both age and gender were anticipated to exert important modifying influences on lifestyle incongruity. The addition of these contextual effects to the lifestyle model shown above in equation 1 generates the following analytic model which was calculated with the REGRESSION procedure:

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4(x_4 + x_5) + b_5(x_4 - x_5) + b_6x_6 + b_7x_7 + b_8x_8 + e. \quad (2)$$

TABLE 1. Descriptive statistics and item-total correlation for the items in the material style of life index¹

Variable	Mean	S.D.	Item-total correlation
Housing quality (No = 0; Yes = 1)			
Nontraditional style of house	0.833	0.379	0.376
Multiple rooms	0.800	0.700	0.467
Linoleum or tile floor	0.700	0.466	0.496
Well kept and neat	0.900	0.305	0.422
Indoor plumbing	0.600	0.498	0.503
Dose the household own (No = 0; Yes = 1)			
Truck	0.567	0.568	0.539
Electric or gas stove	0.667	0.480	0.494
Refrigerator	0.800	0.407	0.337
Freezer	0.467	0.507	0.544
Stereo	0.600	0.498	0.216
Number of televisions	1.300	0.596	0.253
Videocassette recorder	0.867	0.346	0.254
Portable stereo	0.600	0.498	0.286
Couch	0.700	0.466	0.496
Carpet	0.033	0.182	0.318
Rugs	0.133	0.346	0.429
How many visits last year (0 = 0; 1 = 1-5; 2 = 6+) to			
Western Samoa	0.567	0.568	0.375
Hawaii	0.467	0.571	0.277
US mainland	0.400	0.563	0.430

¹ Item-total correlation is an indicator of the contribution of each item to the total scale score. Those items with the highest item-total correlation tend to be those most clearly marking the public presentation of high status in American Samoa. Chronbach's alpha = 0.811.

In this model, Y is either systolic or diastolic blood pressure, x_1 is age, x_2 is sex, and x_3 is the triceps skinfold measurement. Following equation 1, x_4 represents lifestyle and x_5 represents household economic resources. These two variables have been normalized to a mean of 50 and a standard deviation of 10 to account for the different metrics of the two variables. The sum of these two terms is an aggregate of socioeconomic status indicators or SES, and the difference of these two terms is lifestyle incongruity. (Note that lifestyle incongruity is measured here as a continuous variable, so that individuals differ in the degree of incongruity as opposed to being allocated to a fixed category of incongruity.) The subsequent terms are interaction terms accounting for how lifestyle incongruity differentially affects groups within the sample: x_6 is the interaction (calculated as the product) of lifestyle incongruity and sex, x_7 is the interaction of lifestyle incongruity and age, and x_8 is the three-way interac-

TABLE 2. Averages and standard deviations of key selected variables for Samoan households, male heads, and spouses

Variable	Males (N = 30)		Females (N = 26)	
	Mean	S.D.	Mean	S.D.
Age, years	53.9*	6.8	47.0*	11.5
Triceps skinfold (mm)	16.5***	7.2	39.0***	11.2
Systolic blood pressure (mm Hg)	144.1*	21.9	129.6*	18.6
Diastolic blood pressure (mm Hg)	90.8*	13.4	82.3*	12.3
Household variables				
	Mean		S.D.	
Aggregate SES ¹	99.38		15.70	
Lifestyle incongruity	-0.80		12.96	

¹ Aggregate SES is the sum of the material lifestyle index and economic resources; lifestyle incongruity is the difference of these two terms. See text for details on the measurement and construction of these variables.

* $P \leq 0.05$.

** $P \leq 0.01$.

*** $P \leq 0.001$.

tion of lifestyle incongruity, sex, and age. Since aggregate SES and lifestyle incongruity are household variables, the degrees of freedom of the regression total 30, the number of households represented, not 56, the number of individuals sampled. Tests of statistical significance have been appropriately adjusted.

RESULTS

Characteristics of the sample of 30 male household heads and 26 of their wives are presented in Table 2. It is interesting to note that the mean age is just over 50 years, the beginning of old age according to Samoan culture (or *Fa'aSāmoa*). The men are significantly older, have smaller triceps skinfolds, and have higher blood pressures on average than their spouses. The household characteristics of aggregate SES and lifestyle incongruity were calculated as noted above. These variables are sample-specific and do not offer an easy comparison to other populations.

The regression model starts by adjusting for the covariates of age, sex, and triceps skinfold thickness as a measure of adiposity. Next, the main effects, aggregate SES, and lifestyle incongruity are tested. The first column in Table 3, labeled main effects model, takes into consideration just these

TABLE 3. Standardized regression coefficients from regression of systolic and diastolic blood pressure in Samoan household heads (N = 30) and spouses (N = 26), main effects model vs. contextual model

Variable	Main effects model	Contextual model
Systolic blood pressure		
Age	0.172	0.205
Sex	-0.368	-0.524*
Triceps skinfold	0.122	0.209
Aggregate SES	0.040	0.041
Lifestyle incongruity	-0.039	0.020
Lifestyle incongruity \times sex		0.111
Lifestyle incongruity \times age		-0.876**
Lifestyle incongruity \times age \times sex		1.042***
Adjusted R ²	0.061	0.217**
Diastolic blood pressure		
Age	0.097	0.107
Sex	-0.452*	-0.563**
Triceps skinfold	0.217	0.274
Aggregate SES	0.032	0.049
Lifestyle incongruity	-0.102	-0.106
Lifestyle incongruity \times sex		0.152
Lifestyle incongruity \times age		-0.894**
Lifestyle incongruity \times age \times sex		0.958**
Adjusted R ²	0.051	0.196*

* $P \leq 0.05$.

** $P \leq 0.01$.

*** $P \leq 0.001$.

five terms. This model does not indicate a statistically significant association between the predictor variables and either systolic or diastolic blood pressure. The contextual model includes the interaction terms which represent the ethnographically salient intra-cultural modifiers of the lifestyle incongruity effects. These interactions test for age and gender effects on how lifestyle incongruity is associated with blood pressure. When the interaction terms are added in to the regression model, both regressions become significant, and the pattern is exactly the same for systolic and diastolic blood pressure. Gender is significant as a covariate, and the age by lifestyle incongruity interaction term, as well as the age by sex by lifestyle incongruity interaction term, is significant, with the three-way interaction term having the highest beta in each case.

The nature of the three-way interaction term is illustrated in Figure 2. The regression equations are evaluated for men and women at one standard deviation below and above the mean for lifestyle incongruity and age. The younger males show a strong increase in blood pressure with increasing

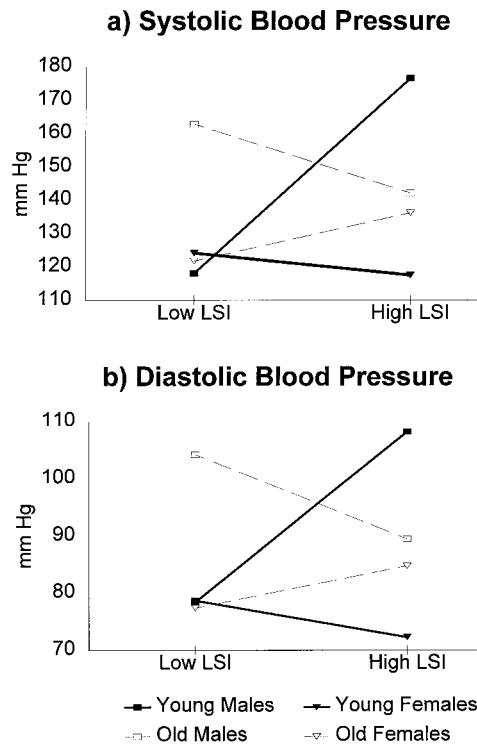


Fig. 2. Graphic representation of the three-way interaction term for (a) systolic and (b) diastolic blood pressure based on the contextual model regressions (equation 2) presented in Table 3. The regressions are evaluated for males and females one standard deviation above (old, high lifestyle incongruity) and one standard deviation below (young, low lifestyle incongruity) mean values of age and lifestyle incongruity with all other variables taking their mean values.

lifestyle incongruity, whereas older men show a decrease with increasing lifestyle incongruity. In women, a reversed but much smaller effect is seen.

DISCUSSION

The Samoan example highlights the modifying role of intracultural diversity. It was hypothesized that certain cultural dimensions of Samoan society may alter the meaning of lifestyle incongruity within specific social contexts. Perhaps the most salient of these dimensions for Samoans is gender. Distinctions of power, position, and place between men and women in Samoan society have been noted since early contact (Stair, 1897; Turner, 1884) through Margaret Mead (1928, 1969) to the present (Holmes and

Holmes, 1992; O'Meara, 1990; Shore, 1982). Shore contends that the division between men and women begins in the geographic, ideological, and cosmological orientation of the traditional Samoan village—women near the core and toward the shore and men toward the periphery and in the bush—and informs virtually all social processes from daily life to important rituals and life goals.

In Samoa, the goal of most men is to be elected *matai*, literally the titled head of an extended family, and to assume control over the family resources. It is the responsibility of the *matai* to administer family lands and property, settle domestic disputes, coordinate the household labor force, promote family unity and prestige, and represent the family in the village council (*fono*). Toward these ends, it behooves the *matai* and those aspiring to *matai* status to construct their behavior and presentation of self carefully, taking into consideration the relative status of different families and different *matai* titles. The constant external validation sought and given for Samoan men under this system makes them perfect candidates for the mediating processes of cardiovascular reactivity noted above. It should be emphasized also, however, that, unlike in past times, the definition of prestige and presentation of self is very much bound up in the maintenance of a particular style of life.

By contrast, women's roles in Samoa involve community- and family-centered activities such as mat weaving, church maintenance, village sanitation and cleanliness, and health and household chores (Baker, 1986). The goal of most women is to have many healthy, successful children. A wife's status reflects her husband's *matai* title, if he is titled, and she must support and further validate her husband's status in the village through her work in the household. The sphere of interaction for women in Samoa is much more family-oriented than for men. From such ethnographic information, it is to be expected that, within the household, the implications of lifestyles and lifestyle incongruity will have different meanings for males and females.

Similarly, age constitutes another important element of intracultural diversity. Work, authority, and prestige change as individu-

als grow older. The onset of old age and the adoption of different terms to refer to men (*matuaali'i*) and women (*olomatua*) begin at about age fifty. As Holmes and Holmes (1992: 96) note:

Old age is invariably identified by young and old alike as "the best time of life." It is a time when one is highly respected, when demands on one's time and energy are at a minimum, when most of life's taboos have been lifted, and when one can sit back if he wishes and rely on the support of children and relatives.

The demands and expectations of older Samoans are lowered while simultaneously their position in the community is enhanced, deriving more from age than from characteristics of the household or rank of the *matai* title. In many senses, once a man or woman reaches elder status, the pressure to achieve is relieved. This ethnographic information suggests that lifestyle incongruity will have different meaning for younger and older Samoan adults, and therefore age is also an important context of intracultural diversity. The substantial effect of the lifestyle by age by sex interaction term on both systolic and diastolic blood pressure reinforces the significance of these dimensions of intracultural diversity.

These conclusions must, of course, be tempered by recognizing the small sample employed here. Although the use of regression diagnostics failed to indicate the presence of any influential cases, the selection of a small sample may be biased in unknown ways. By the same token, however, this study fits into a larger body of research examining the links between social status, social context, and health outcomes. The basic findings regarding lifestyle incongruity have been replicated across several different sociocultural settings. This contributes to confidence in the way in which the findings have been extended here and suggests that further study of the modifying influence of social context is warranted (Dressler, 1995a).

The aim of this paper has been to illustrate the convergence of several different traditions of theoretical and empirical work, convergence that can lead to more theoretically satisfying and empirically powerful models of social change and disease risk. First, we have argued that a refined under-

standing of political-economic processes in the context of the global economic system is useful in understanding the importance of particular variables at the local level. Specifically in this regard we have argued that the particular importance assumed by the consumption of middle-class material lifestyles in diverse communities is far from accidental. Rather, the salience of these lifestyles is generated by political and economic processes of the most macro sort, whether it be the introduction of cash crops into the West Indies (Dressler, 1982) or the political innovation of the civil rights movement in the American South (Dressler, 1993). Furthermore, while individual lifestyle aspirations are changed in these processes, the growth of local economies are rarely sufficient to keep pace with the culturally and politically constructed aspirations. In short, so-called development processes are virtually insured to result in substantial proportions of a population attempting to maintain a lifestyle incommensurate with their socioeconomic mobility and hence at risk of disease. And the choices made by individuals are far from voluntary; rather, it results nearly by definition of the process of development.

We hope this perspective certainly answers the critique offered by some (e.g., Singer, 1989) that models in human biology ignore the larger political-economic forces influencing local communities. Furthermore, it goes them one better in the sense that we have specified measurable variables that can be demonstrated to affect biological parameters through biologically plausible mechanisms. These empirical issues are all too easily glossed over by some.

This work also demonstrates some of the ways in which a political-economic perspective needs to be expanded. In many discussions it is only the macrosocial dimensions of political-economic processes that are given prominence (Worsley (1984) is a notable exception to this). Little consideration is given to the ways in which social and economic forces set in motion at a macrosocial level are worked out and realized at the microsocial level. Our emphasis here on the local community, and especially on how lifestyle incongruity has different effects within varying social contexts, should serve as a

caution to those who would argue that global economic processes lead to invariant effects within specific communities. Also, the way in which local social contexts will modify these processes will vary from one community to another, depending on circumstances unique to each community. Certainly major determinants of social position such as age and sex are likely to be important in many settings; but, as observed elsewhere (Dressler, 1995b), social origin and social class can also influence the strength and nature of effects at the local level. These linkages and interactions between the macro and the micro (DeWalt and Pelto, 1985) need to be incorporated systematically into the rapprochement of political-economy and human biology.

We are not arguing that these factors account completely for individual differences in blood pressure. Indeed, in some respects, the amount of variability accounted for by the models in Table 3 is rather small. If, however, the variability accounted for by the model including the social variables and interaction effects is compared with that accounted for by the model including only conventional variables, the additional explanatory power is clear. Also, inspecting the sheer magnitude of the blood pressure effects in Figure 2 indicates that, especially for certain members of the community, there is a marked pressor effect of the social factors. Finally, in part the total amount of variance explained by the model is a function of the restricted age range of the sample. What is more important here than the total variance explained, however, are the plausibility and empirical utility of a model that explicitly links individual-level social variables with macrosocial and political-economic factors.

In the final analysis, the utility of this general perspective and the specific models presented here must be determined through careful empirical work, replicated in a variety of settings. We hope our efforts here and elsewhere will help to spur such work.

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LITERATURE CITED

- Baker TS (1986) Changing socialization patterns of contemporary Samoans. In: PT Baker, JM Hanna, and TS Baker (eds.): *The Changing Samoans: Behavior and Health in Transition*. New York: Oxford University Press, pp. 146-173.
- Beaglehole R (1990) International trends in coronary heart disease mortality, morbidity, and risk factors. *Epidemiol. Rev.* 12:1-15.
- Bindon JR (1984) Body build and composition of Samoan children: Associations with infant feeding patterns and infant weight-for-length status. *Am. J. Phys. Anthropol.* 63:379-388.
- Bindon JR, and Baker PT (1985) Modernization, migration, and obesity among Samoan adults. *Ann. Hum. Biol.* 12:67-76.
- Bindon JR, and Crews DE (1993) Changes in some health status characteristics of American Samoan men: A 12 year follow up study. *Am. J. Hum. Biol.* 5:31-38.
- Bindon JR, Crews DE, and Dressler WW (1991) Lifestyle modernization, and adaptation among Samoans. *Coll. Antropol.* 15:101-110.
- Crews DE (1988) Body weight blood pressure and the risk of total and cardiovascular mortality in an obese population. *Hum. Biol.* 60:417-433.
- Crews DE, Kamboh MI, Bindon JR, and Ferrell RE (1991) Genetic studies of human apolipoproteins XVII. Population genetics of apolipoprotein polymorphisms in American Samoa. *Am. J. Phys. Anthropol.* 84:165-170.
- Crews DE, Bindon JR, and Kamboh MI (1993) Apolipoprotein polymorphisms and phenotypic variability in American Samoans: Preliminary data. *Am. J. Hum. Biol.* 5:39-48.
- DeWalt BR, and Pelto PJ (1985) *Micro and Macro Levels of Analysis in Anthropology: Issues in Theory and Research*. Boulder: Westview Press.
- Dressler WW (1982) *Hypertension and Culture Change: Acculturation and Disease in the West Indies*. South Salem, NY: Redgrave Publishing.
- Dressler WW (1993) Social and cultural dimensions of hypertension in blacks: Underlying mechanisms. In JCS Fray and JG Douglas (eds.): *Pathophysiology of Hypertension in Blacks*. New York: Oxford University Press, pp. 69-89.
- Dressler WW (1994) Social status, age, and blood pressure in an English general practice. *Coll. Antropol.* 18:73-80.
- Dressler WW (1995a) Modeling biocultural interactions: Examples from studies of stress and cardiovascular disease. *Yearbook of Physical Anthropology* 38:27-56.
- Dressler WW (1995b) Intracultural diversity and the sociocultural correlates of blood pressure: A Jamaican example. *Med. Anthro. Quart.* 9:291-313.
- Dressler WW, Dos Santos JE, Gallagher PN Jr, and Viteri FE (1987) Arterial blood pressure and modernization in Brazil. *Am. Anth.* 89:389-409.
- Goffman E (1951) Symbols of class status. *Br. J. Sociol.* 2:294-304.
- Holmes LD, and Holmes ER (1992) *Samoan Village: Then and Now*, 2nd ed. New York: Holt, Rinehart and Winston.
- Janes CR (1990) *Migration, Social Change, and Health*. Stanford, CA: Stanford University Press.
- Knight AL (1993) *Social Status and Arterial Blood Pressure in a Samoan Community*. Marts Thesis,

- Department of Anthropology, The University of Alabama.
- McGarvey ST, and Schendel DE (1986) Blood pressure of Samoans. In PT Baker, JM Hanna, and TS Baker (eds.): *The Changing Samoans: Behavior and Health in Transition*. New York: Oxford University Press, pp. 350–393.
- Mead M (1928) *Coming of Age in Samoa*. London: Cox and Wyman, Ltd.
- Mead M (1969) *Social Organization of Manu'a*, 2nd ed. Honolulu: Bishop Museum Press.
- O'Meara JT (1990) *Samoan Planters: Tradition and Economic Development in Polynesia*. New York: Holt, Rinehart and Winston.
- Shore B (1982) *Sala'ilua: A Samoan Mystery*. New York, Columbia University Press.
- Singer M (1989) The limitations of medical ecology: The concept of adaptation in the context of social stratification and social transformation. *Med. Anthropol.* 10: 223–234.
- Smith TW, Allred KD, Morrison CA, and Carlson SD (1989) Cardiovascular reactivity and interpersonal influence: Active coping in a social context. *J. Pers. Soc. Psychol.* 56:209–218.
- Stair JB (1897) *Old Samoa or Flotsam and Jetsam from the Pacific Ocean*. London: The Religious Tract Society.
- Turner G (1884) *Samoa, A Hundred Years Ago and Long Before*. London: Macmillan.
- Veblen T (1918) *Theory of the Leisure Class*, new ed. New York: BW Huebsch.
- Vernon S, and Buffler PA (1988) The status of status inconsistency. *Epidemiol. Rev.* 10:65–86.
- Waldron I, Nowotakski M, Freimer M, Henry JP, Post N, and Witten C (1982) Cross-cultural variation in blood pressure. *Soc. Sci. Med.* 16:419–430.
- Weiner JS, and Lourie JA (1981) *Practical Human Biology*. New York: Academic Press.
- Whitt HP (1983) Status inconsistency: A body of negative evidence or a statistical artifact? *Social Forces* 62:201–233.
- Worsley P (1984) *Three Worlds*. London: Weidenfeld and Nicolson.
- Young A (1980) The discourse on stress and the reproduction of conventional knowledge. *Soc. Sci. Med.* 14B: 133–146.